GLOBAL SPEC (PTY) LTD
Reg. No. 98/06991/07 Est. 1991

NON DESTRUCTIVE TESTING SERVICES
Inspection Services for Marine, Industrial, Offshore & Mining Equipment

Certified ISO 9001:2015 Quality Management System

ISO 9001
BUREAU VERITAS Certification
BUREAU VERITAS 1828
UKAS QUALITY MANAGEMENT 008

28 years
1991-2019

Location of key offices and NDT facilities

Global Spec's main facilities are based in Cape Town, South Africa.
This is supplemented by facilities in Elsies River (GasCon Plant) and the new A-Berth Facilities at the Cape Town Harbour

Classification Society Approvals

The company is approved worldwide as service supplier in Non-Destructive Testing and Inspection Services by the following classification accreditation societies

- Bureau Veritas
- Korean Register
- Lloyd's Register
- International Register
- American Bureau of Shipping
- Registro Italiano Navale Group
- Det Norske Veritas-Germanischer Lloyd

Services Offered

NDT Services for all Test methods:

1) Thickness Measurements
2) Ultrasonic Flaw Detection
3) X-Ray, Gamma Ray and Real Time Radiography
4) Magnetic Particle Examination
5) Liquid Penetrant Examination
6) Eddy Current
7) **Destructive Testing (SANAS Accredited Lab.)**
8) **Drone Aerial Services**

Rig Surveys:

1) Mooring chain surveys, re-certification, repairs, material analysis and proof loading up to 3" diameter
2) Complete structure. (Special Periodical Surveys)
3) Drilling, Subsea equipment etc.
4) Mechanicals and All Marine

General Shipping Special Surveys :

1) Tankers & Bulk Carriers
2) Passenger liners
3) Fishing Vessels
4) Supply Vessels

Industrial:

1) Oil Refineries
2) Civil Construction
3) Automobile an Aviation Industries
4) **High Mast Poles**

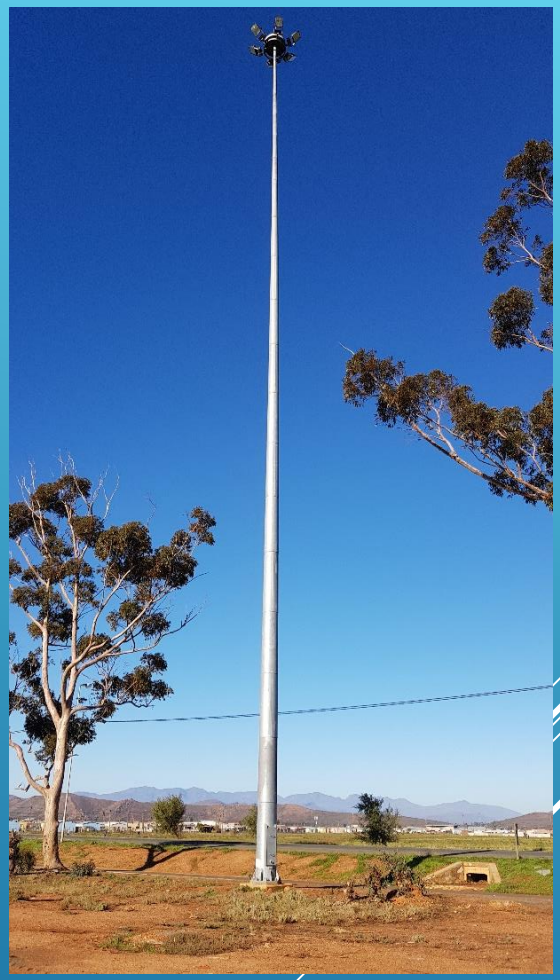
EXAMINATION OF HIGH MAST LIGHT POLES

PREVENTION OF CATASTROPHIC STRUCTURAL FAILURE OF HIGH MAST POLES IN THE INTEREST OF PUBLIC SAFETY

Municipalities have a legal obligation to ensure that high mast poles are structurally safe, hence the need to test and repair them at regular intervals.

Scope of services/ intervention required that is based on preventative maintenance:

1. **Conduct visual inspection on entire mast, from spotlight level down to welds, bolts, nuts & concrete base above ground level.**
2. Conduct Magnetic Particle Inspection (MPI) on base & gusset welds after cleaning.
3. Perform Thickness Gauging (UTM) along two (2) bands of the mast up to a maximum height of one (1) meter. Recoat the same areas with cold galvanize after inspection & repairs of identified flaws.
4. Conduct welding repairs on any projectable indication e.g. cracks & retest with (MPI) method – recoat areas with Black Bituminize paint.
5. Provide detailed report for each high mast pole that has been tested for maintenance record keeping.
6. Provide detailed report for each repair and retest of the high mast pole for maintenance record keeping



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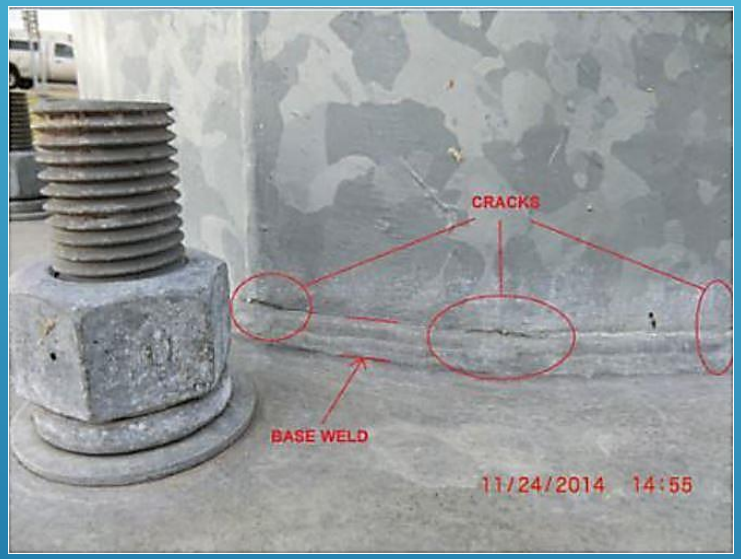
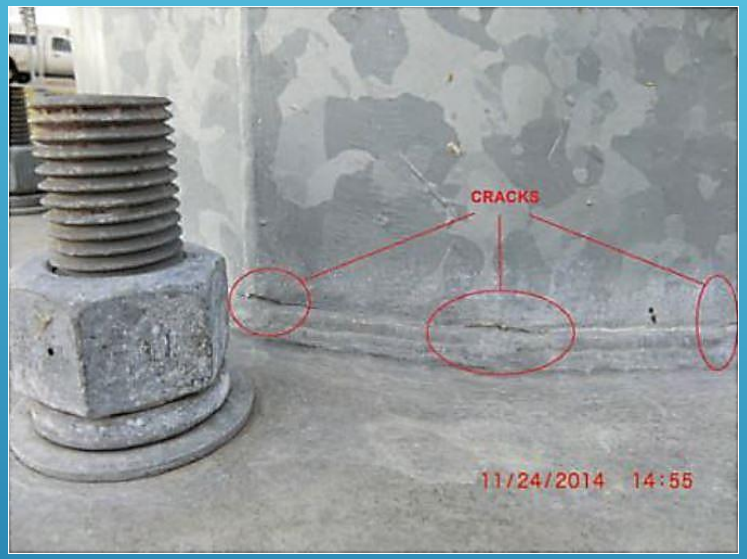
Reg. No. 98/06991/07 Est. 1991 (PTY) LTD.

MPI Examination of welds

Identification of cracks at toe of Welds (HAZ)

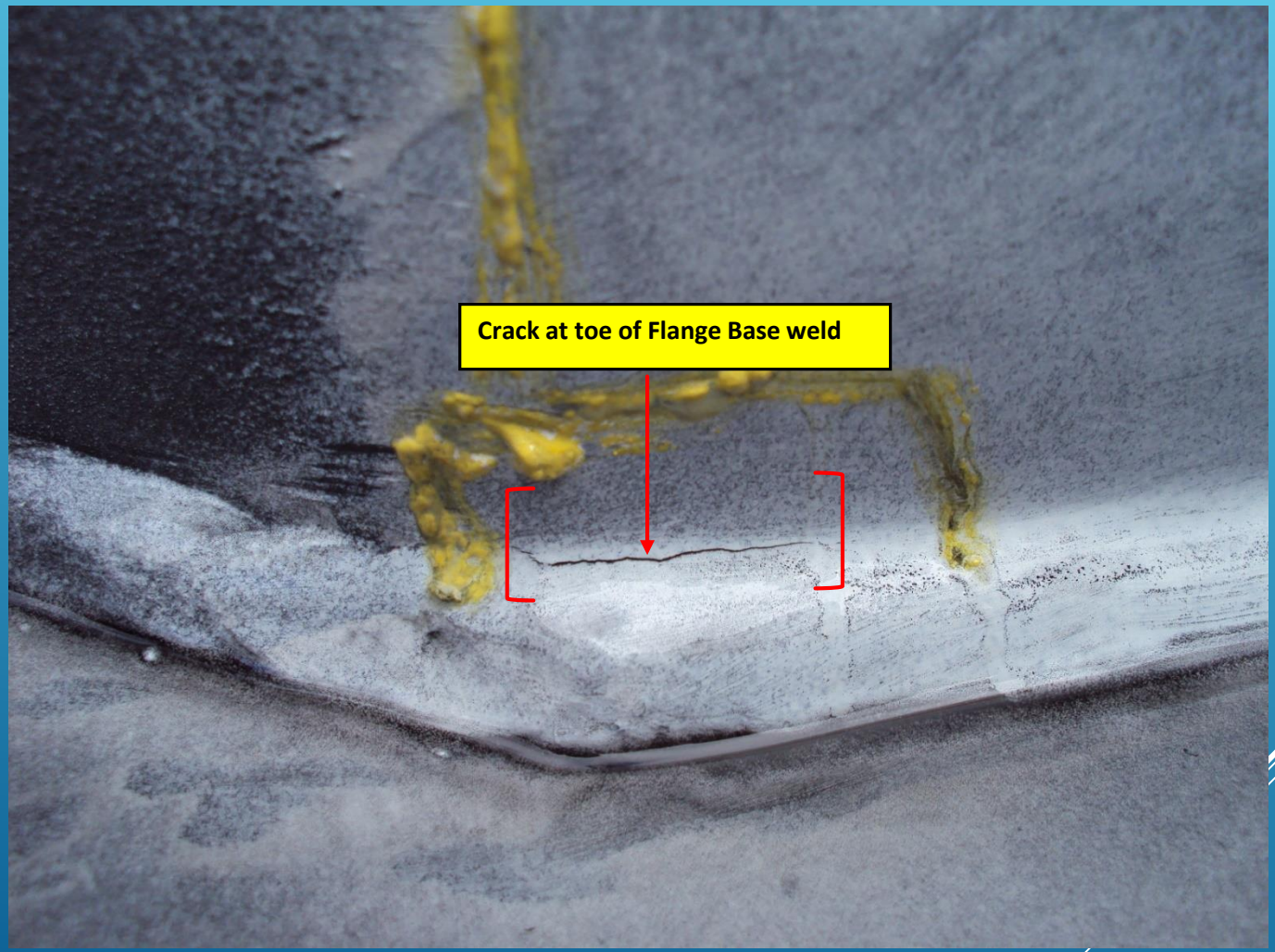




CATASTROPHIC FAILURE

High-Mast Light in Soshanguve after its lighting ring fell

ANCHOR STUD OVER TORQUED DURING INSTALLATION.


Crack at toe of Flange Base weld

Summary of NDT findings or results:

Approximately 265 High Mast Light Poles were inspected over a period of five (5) years in accordance with specifications agreed to by the client.

In some instances visual inspection revealed random isolated **linear indications** at the toe of the flange base and gusset welds.

No weld repairs were required, and the indications were removed by remedial blend grinding and after retesting, were found to be acceptable.

MEDIUM RISK

Conti…

- Cracks in the flange base weld were detected and repaired
- Cracks in the gusset weld
- Cracks that propagate from the flange weld into adjacent parent metal if not detected early enough would result in the collapse of the structure.
- No welding on some areas of the gussets were detected

HIGH RISK

RECOMMENDATION

- **Quality Control procedure** should commence immediately after the poles are installed.
- **Preventative or proactive maintenance plan** must be implemented which can be guided by our key learnings over the last 5 years.
- **Preventative maintenance plan** should allow for visual annual inspection and full NDT inspection every 3 years
- **Maintenance data and records** should be retained on municipal records and should also be recorded on data plates which must be fixed to the pole.
- **Cement caulking** should be actioned on identified base areas.
  All nuts must be checked during the annual visual inspection and tightened to specific torque settings. Nuts can be spot welded to the flange to prevent removal or movement due to wear and tear.

GLOBAL SPEC

Reg. No. 98/06991/07 Est. 1991 (PTY) LTD

In Partnership
with:

DARKWING

AERIAL SOLUTIONS

COMPANY BACKGROUND

Darkwing Aerial Solutions - Founded in 2012

One of the first fully licensed UAV companies in South Africa

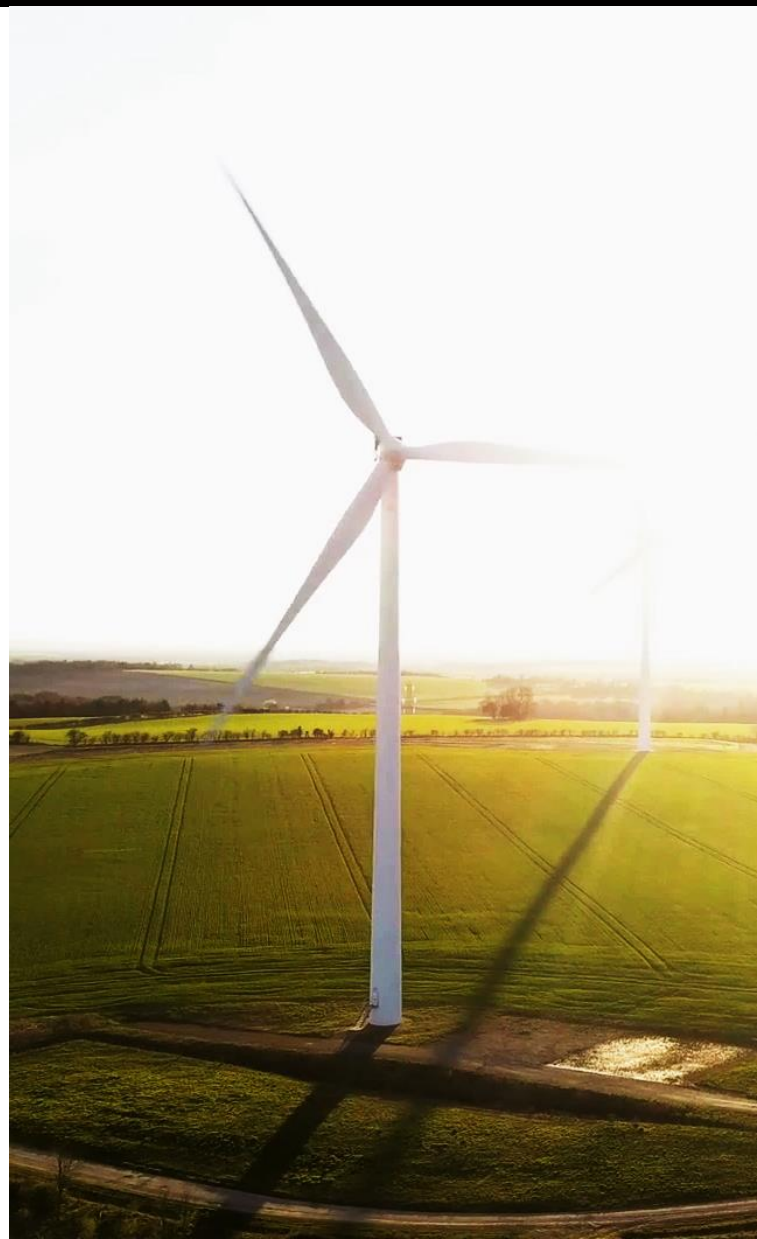
With extensive aerial cinematography and film experience, with several local and international productions, Darkwing became a favourite in the industry.

In 2015, Darkwing directed their focus on the main industrial sectors.

With a combination of film and industrial inspection experience,

INDUSTRIES

- OIL & GAS - ONSHORE/OFFSHORE
- POWER
- MINING
- RENEWABLE ENERGY
- MARITIME
- ENGINEERING
- FILM PRODUCTION



DARKWING SERVICE OFFERING

VISUAL INSPECTION

- HD STILL IMAGERY
- 4K VIDEO
- THERMAL IMAGERY
- SECURITY/SURVEILLANCE

SURVEY

- 2D/3D MAPPING
- LIDAR 3D POINT CLOUD
- UV - CORONA DETECTION

NON DESTRUCTIVE TESTING

- AERIAL NDT
- CONVENTIAL NDT
- PAINT INSPECTION

VISUAL INSPECTION

Darkwing Aerial Solutions make use of state of the art drones that enable close visual inspection & drone surveys to areas deemed difficult to access or time consuming to perform via the traditional routes of rope-access or erection of working structures such as scaffolding.

VISUAL APPLICATIONS

- Live fare stacks inspection
- Flare tip inspection
- Storage tank inspection
- DROPS survey
- Crane inspection
- Derrick inspection
- Platform inspection
- Wind turbine inspection
- Pre shutdown survey
- Building inspection
- High Mast Lighting Poles

INTERIOR INSPECTION

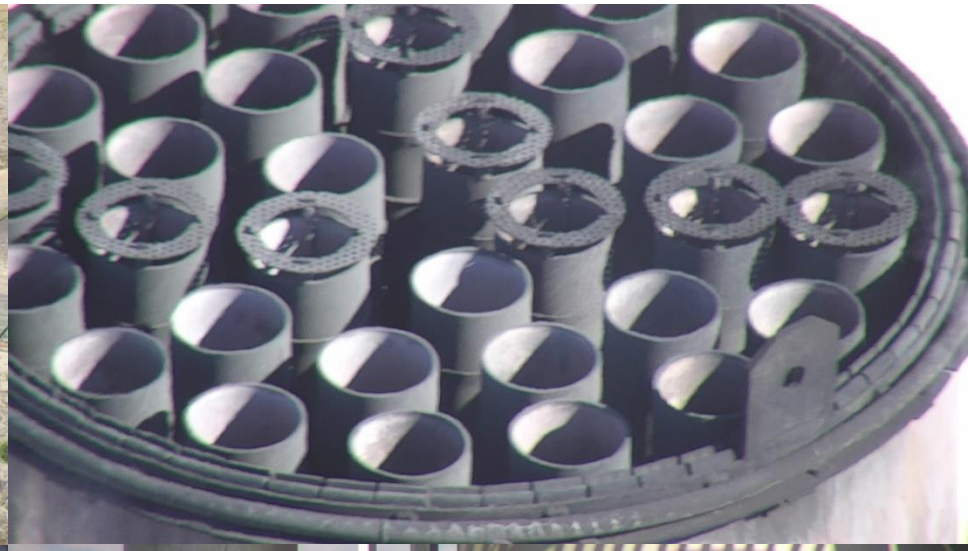
With the the use of a collision tolerable drones we are able to inspect hard to reach area's, that people and other drones are unable to reach safely.

Drones provide a fast and flexible option when cost, efficiency and safety are paramount.

APPLICATIONS:

- Close-up Visual Inspection
- Internal Tank Inspection
- Confined Space Inspection
- In-accessible areas
- Complex Structures

VISUAL INSPECTION - FLARE STACK



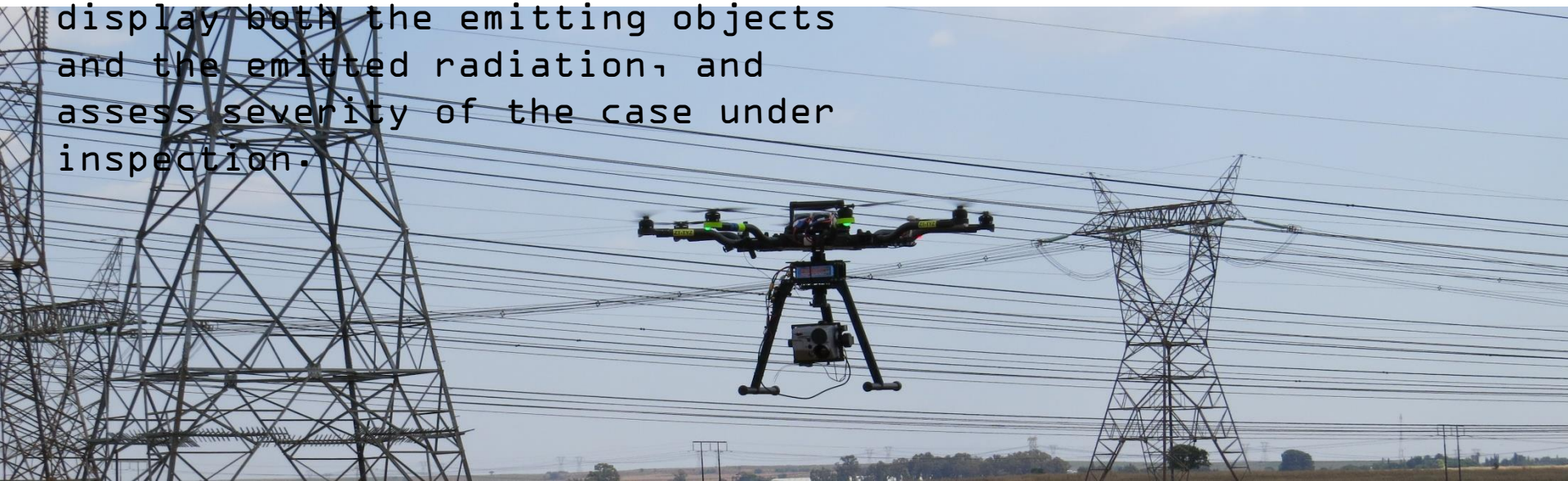
VISUAL INSPECTION - FLARE STACK

VISUAL INSPECTION - TELECOMMUNICATIONS

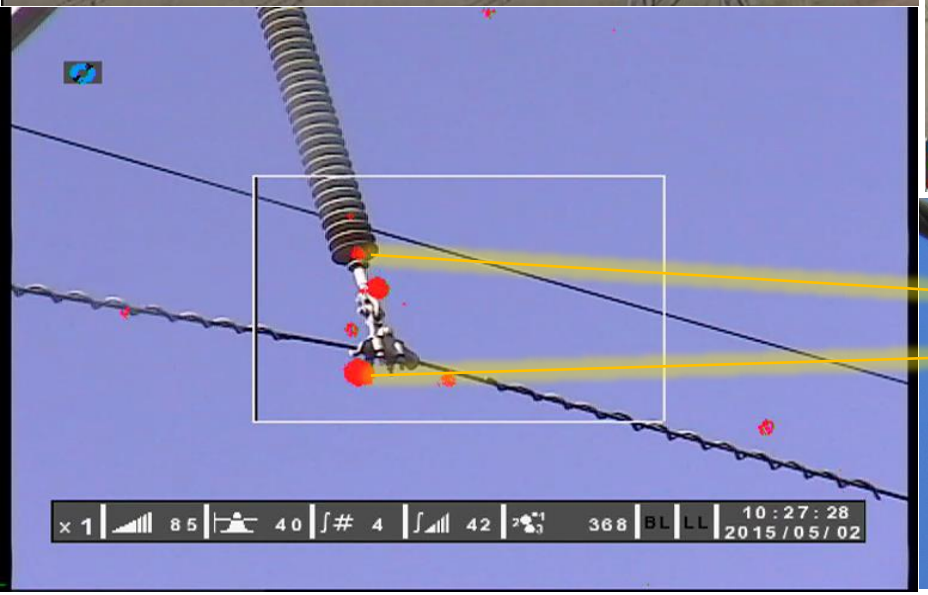
VISUAL INSPECTION - TRANSMISSION LINES

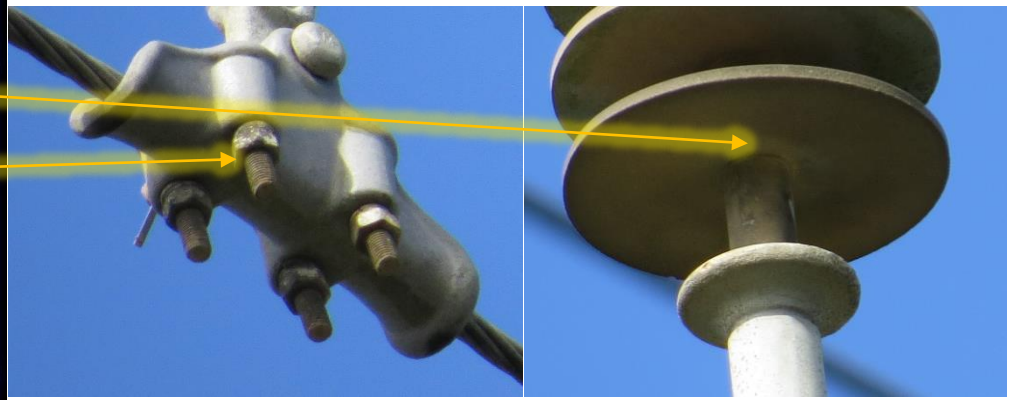
UV INSPECTION - POWERLINES

UV inspection technology is being used for predictive maintenance of high voltage equipment together with IR-thermography and ultrasonic devices. The value added by UV inspection is reflected in its ability to pinpoint corona and arcing, denote failure location, assist predict unavoidable crisis, display both the emitting objects and the emitted radiation, and assess severity of the case under inspection.



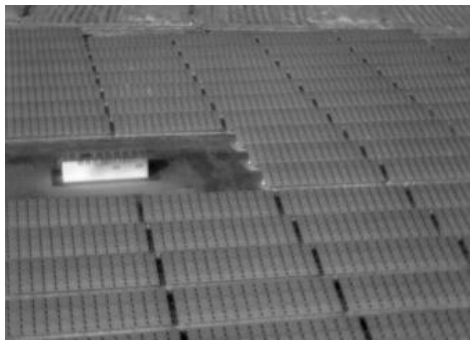
UV INSPECTION - POWERLINES

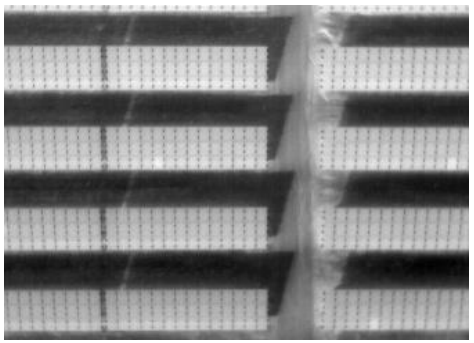


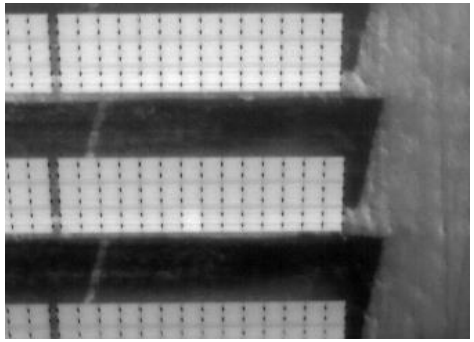


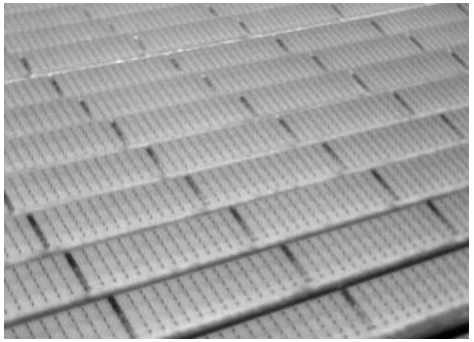
RENEWABLE ENERGY - WIND TURBINES

RENEWABLE ENERGY - SOLAR PLANTS







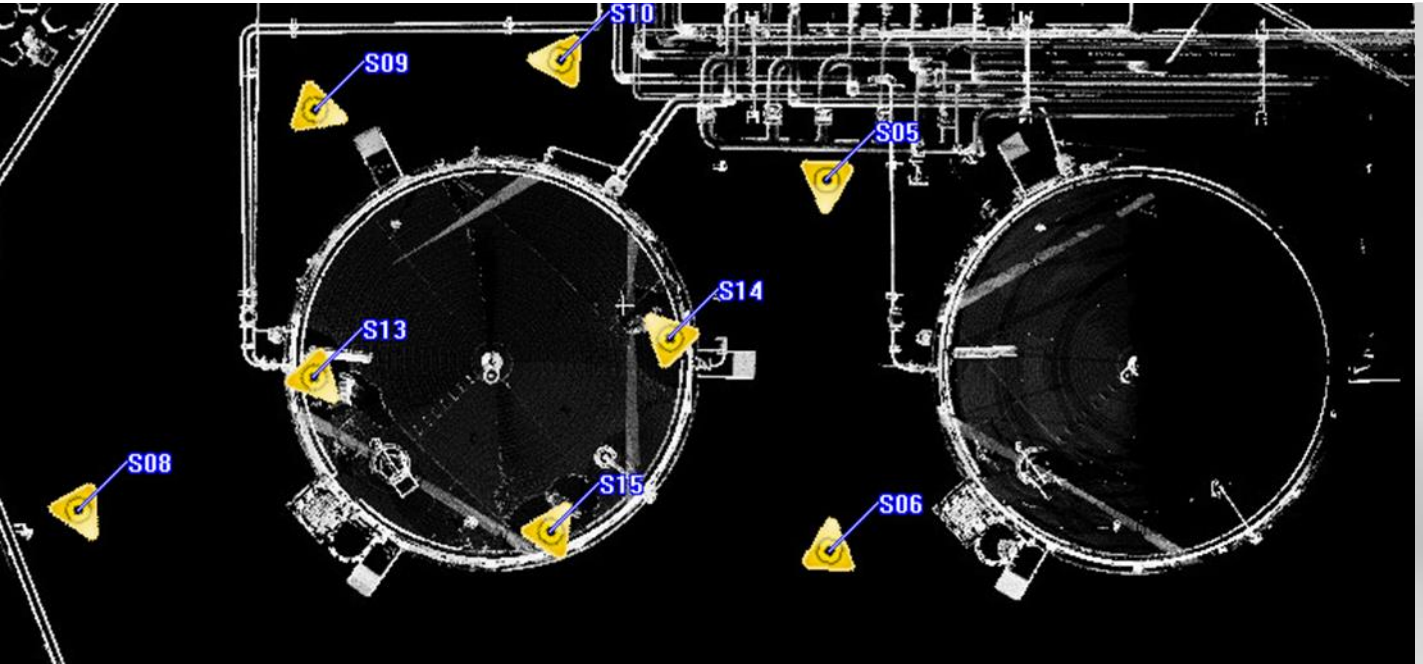


OIL & GAS - REFINERY

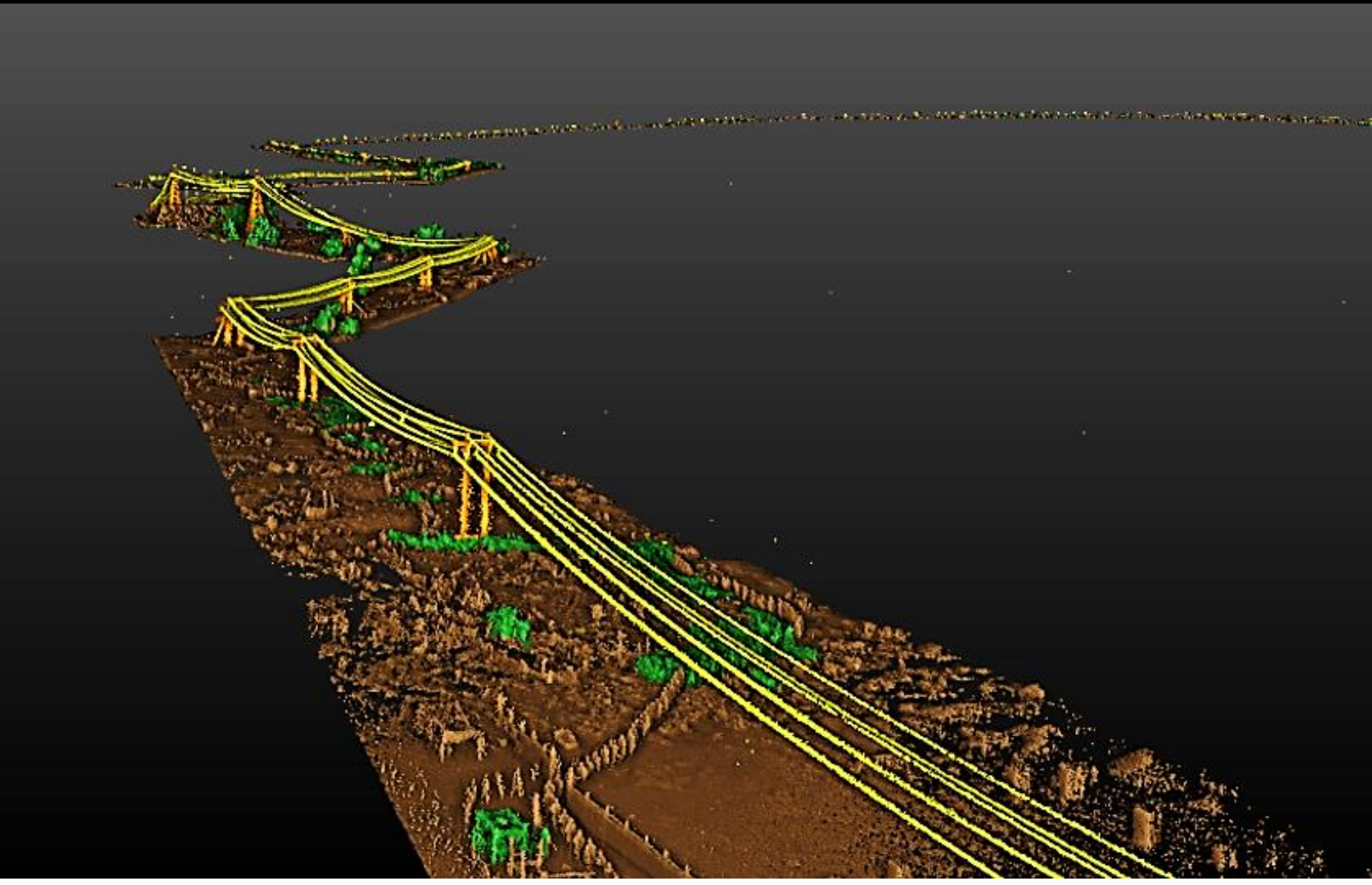
LIDAR & PHOTOGRAMETRY

Darkwing Aerial Solutions offer a unrivalled, comprehensive state-of-the-art solution in Aerial / Terrestrial laser scanning, by integrating UAV and LiDAR technology.

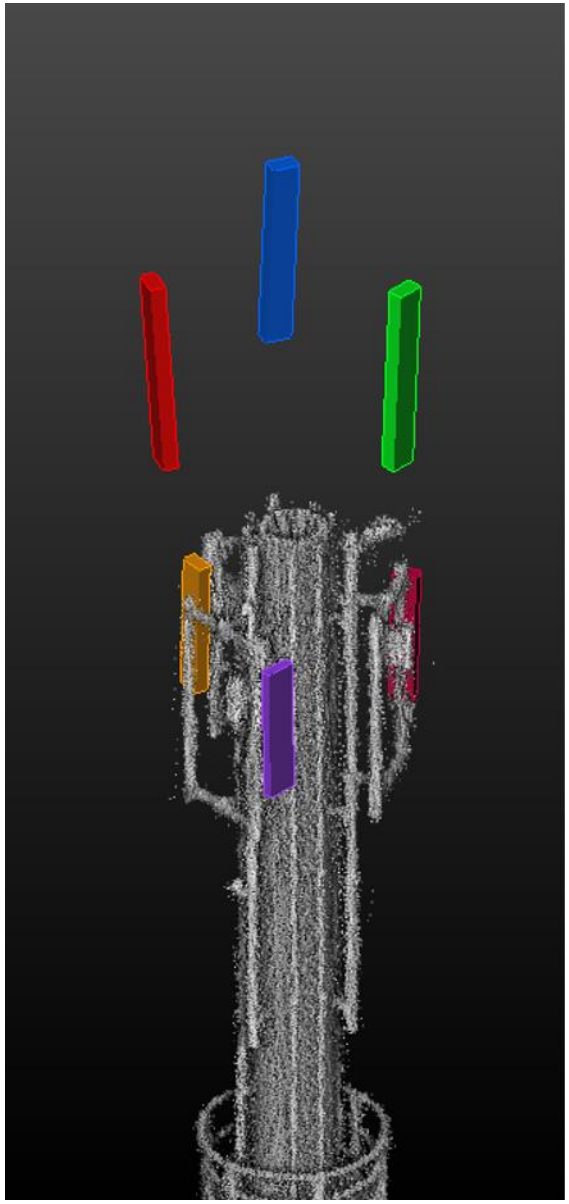
By generating an aerial 3D point cloud of your site, we can reduce the time, cost and complexity of inspections and surveying while providing a detailed 3D model of the area.

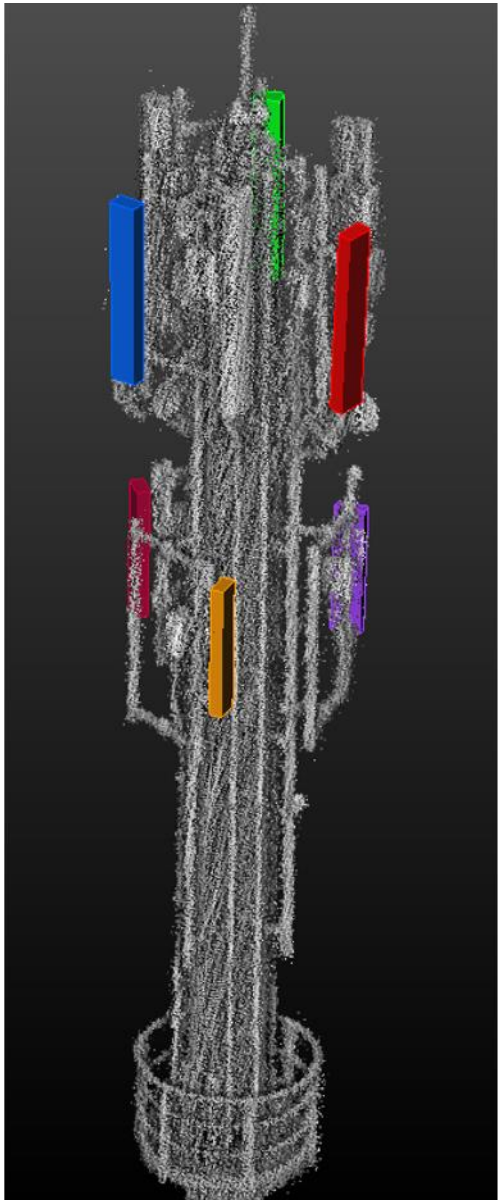


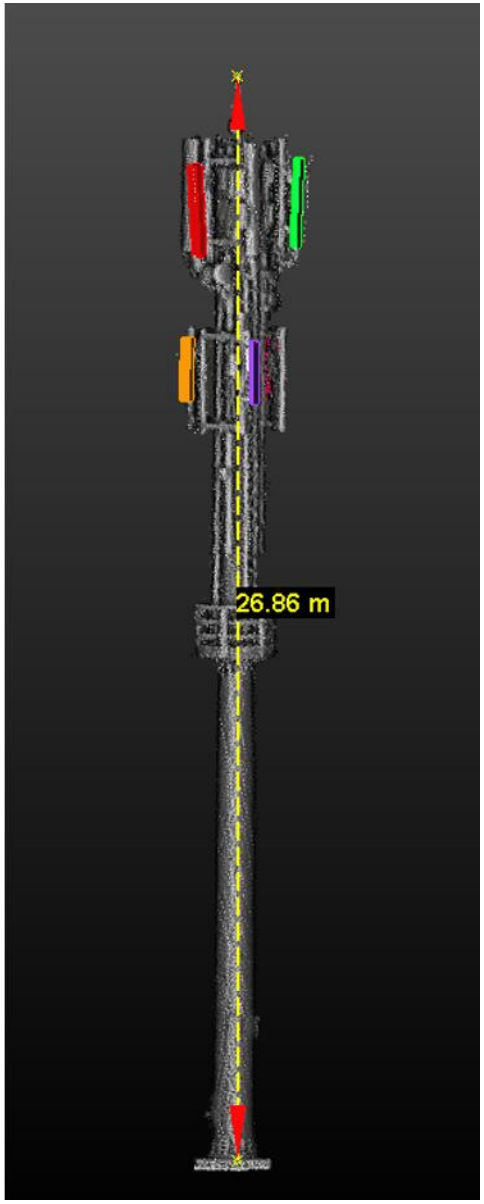
LIDAR RESULTS - POWERLINES



LIDAR RESULTS - TELECOMMUNICATION



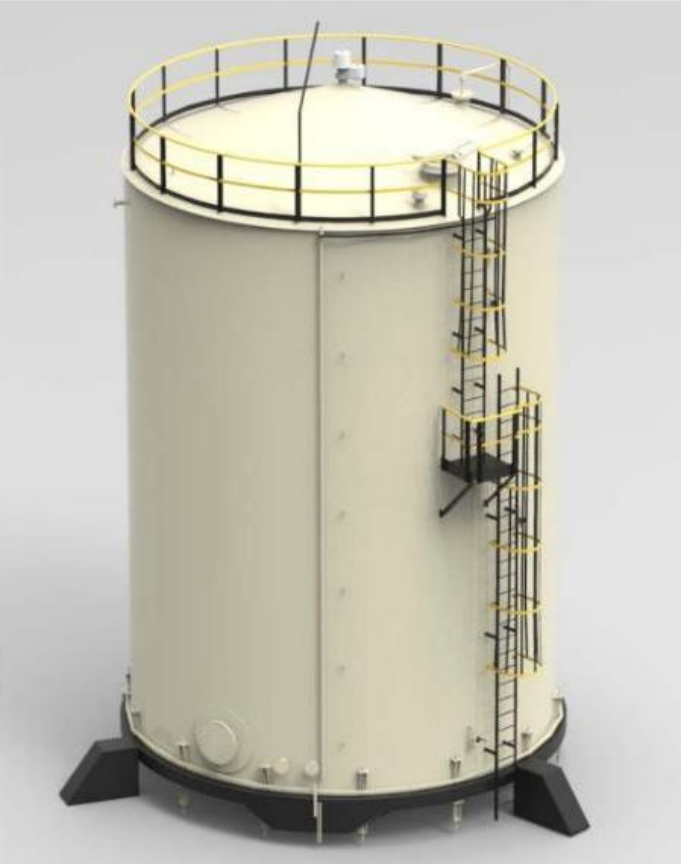


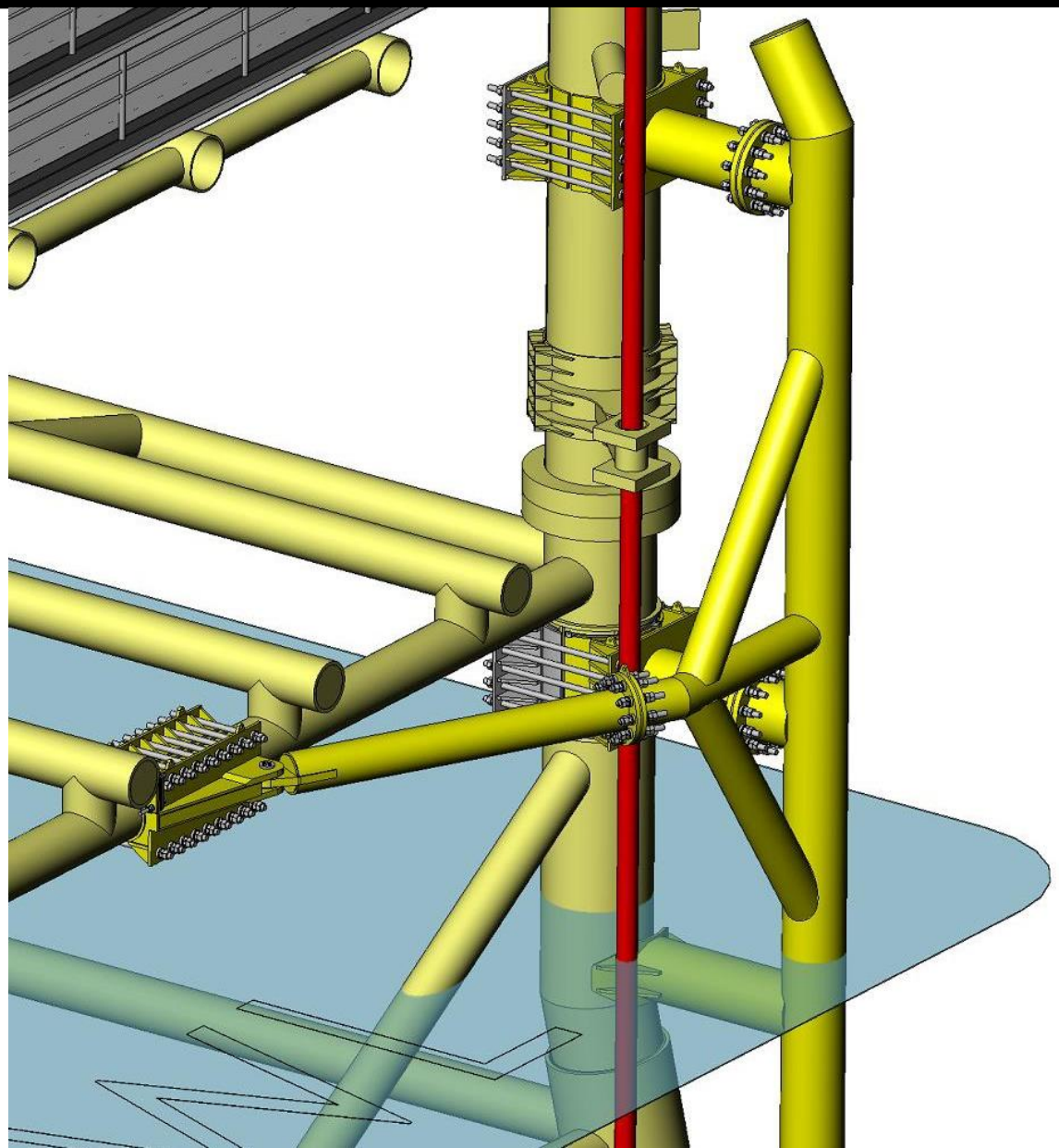


LIDAR RESULTS

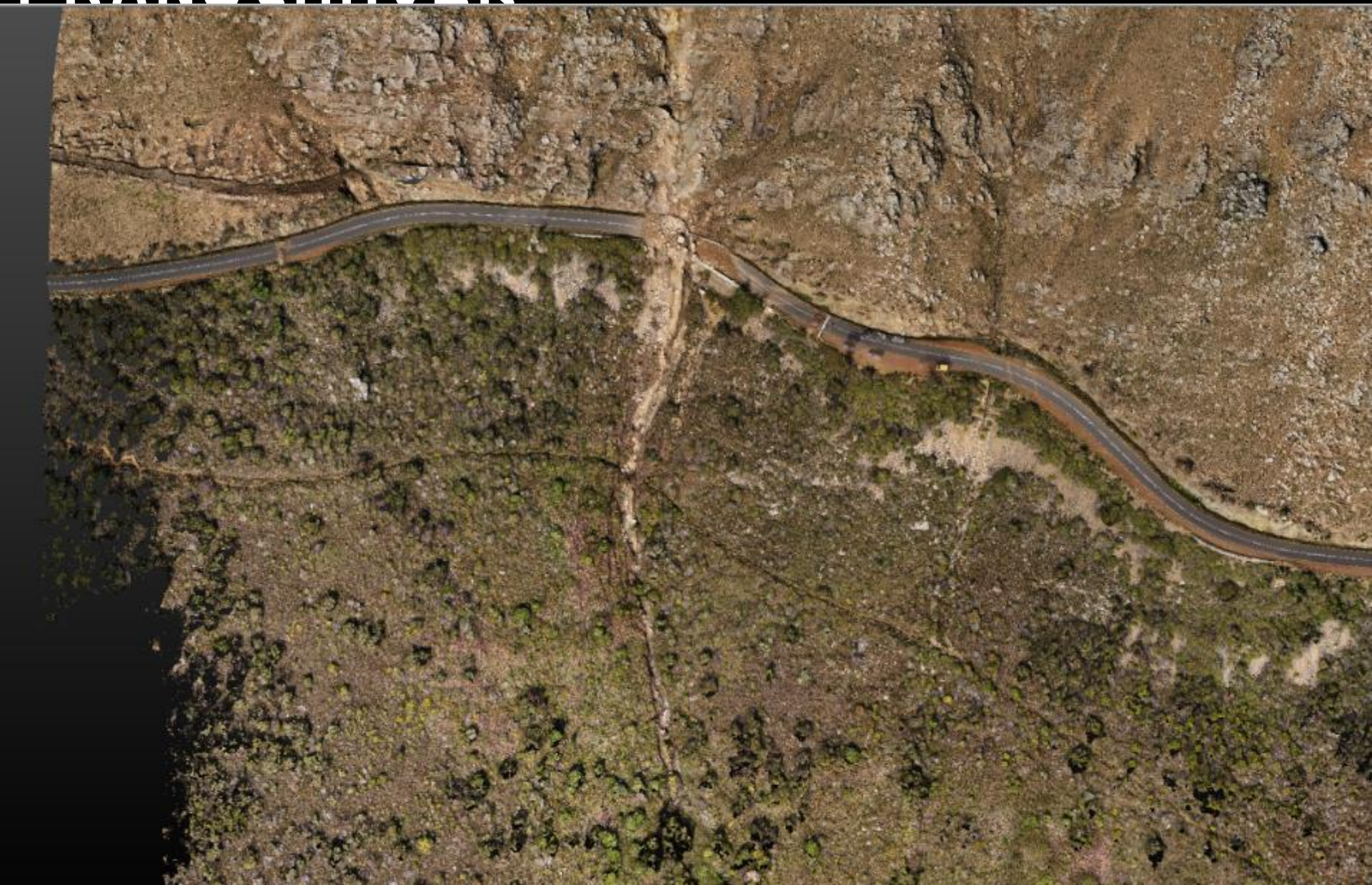
Tank Surface Area Calculations

Description	Colour	Area (SQM)
Vessel, Nozzles + Brackets	Beige	353.8
Concrete Support Structure	Black	98.2
Handrails + Ladders	Yellow	10.1
Handrails + Ladders	Black	29.4
Miscellaneous	Black	1.4
Utilities	Orange	0.3
Utilities	Grey	0.8
	Total	**494.0**

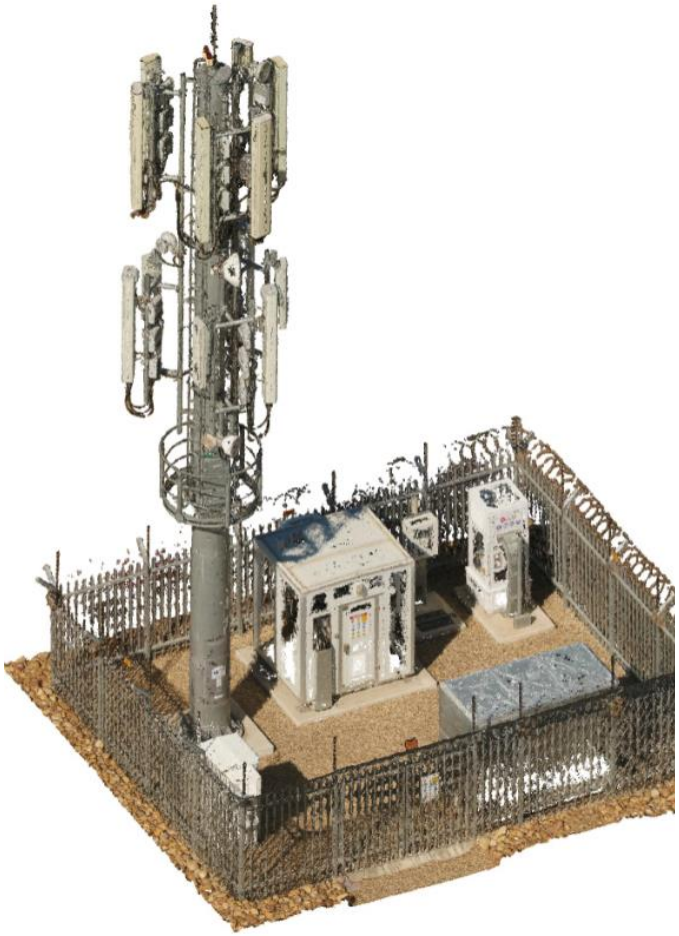




MAPPING RESULTS - FRANSCHHOEK



3D MODELING - TELECOMMUNICATIONS



CASE STUDY #1

COST SAVING:
91%

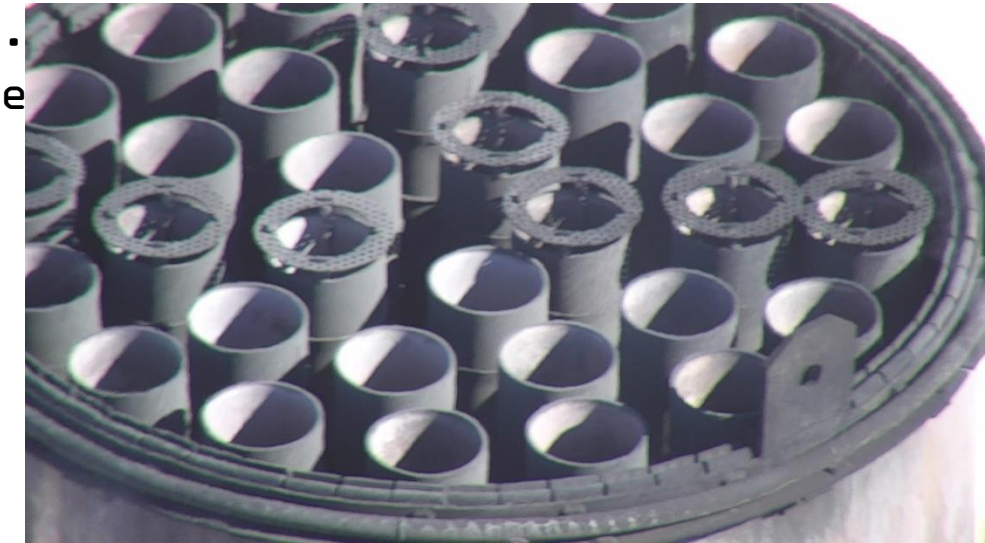
TIME SAVING:
94%

ONSITE MANHOURS REDUCED:
70%

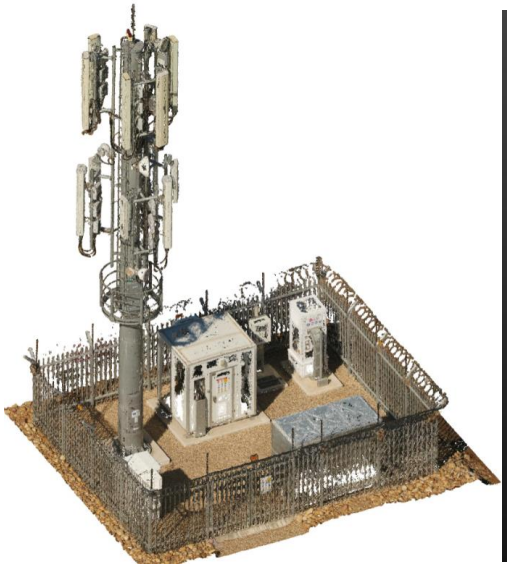
IMPROVED QUALITY:
75%

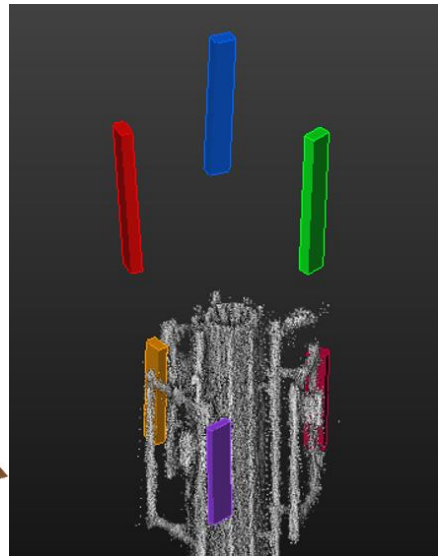
SUMMARY:
Flare structure & tip inspection was due on a Petroleum Refinery. Historically the plant will have to be shut down & access to structure & tip gained through scaffolding or rope access.

In this case Darkwing performed a close-up visual inspection of the "live" flare, and captured



CASE STUDY #2





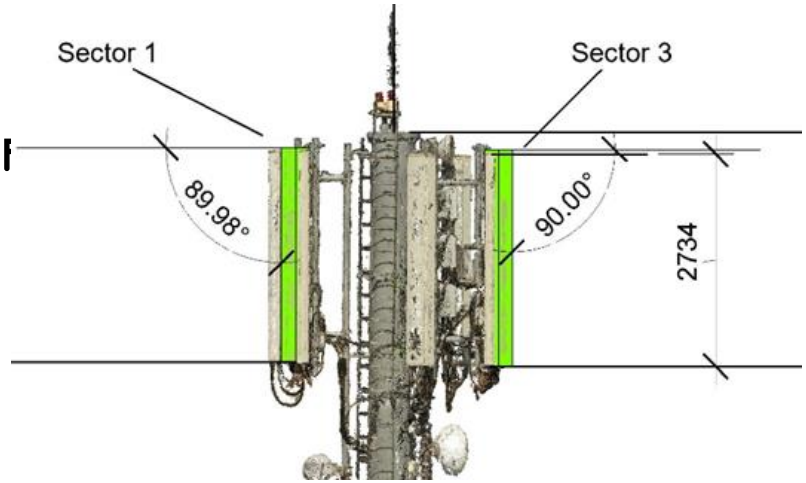
COST SAVING: 2%

TIME SAVING:
40%

ONSITE MANHOURS REDUCED:
30%

IMPROVED QUALITY:
80%

IMPROVED COVERAGE:

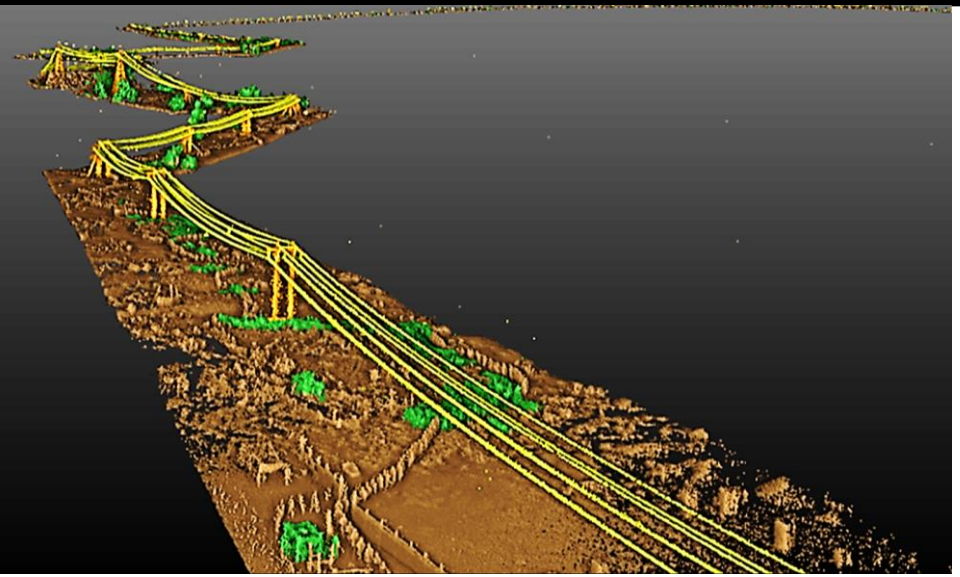


SUMMARY:

Darkwing has been contracted to perform in-depth tower surveys across SA. Historically the surveys performed on the towers was done climbing the towers, and with manual measurements on antenna's.

Darkwing found a solution to perform the surveys & add more

CASE STUDY #3



COST SAVING:
16%

TIME SAVING:
60%

ONSITE MANHOURS REDUCED:
50%

IMPROVED QUALITY:
60%

SUMMARY:
On a recent project Darkwing performed visual inspection, lidar & mapping surveys on powerline structures & surrounds in a informal settlement.

Darkwing made use of high zoom camera's, aerial lidar, survey grade mapping & heavy lift

LICENSE

SOUTH AFRICAN
CIVIL AVIATION AUTHORITY

OPERATING CERTIFICATE
PART 101

State of the Operator: SOUTH AFRICA		
Issuing Authority: SOUTH AFRICAN CIVIL AVIATION AUTHORITY		
ROC No: CAA/G1271D	Certificate #: FO 14232	Operator's Address:
Expiry Date: 31 MAY 2020	Name of Certificate Holder: DARKWING AERIALS (PTY) LTD	PO Box 471 Constantia 7848 Cell: +27 82 552 2554 tom@darkwingaerials.com
Main Base of Operation: Unit 4C Observatory Business Park Lower Scott Road Observatory Cape Town 7925	Is the holder of air service licence G1271D	
The above holder of this certificate has been authorised to operate air service(s) in terms of the above license(s) held in accordance with- *the attached operations specifications; *the provisions of Part 101 of the Civil Aviation Regulations of 2011; *the provisions of the Air Service Licensing Act of 1990 (Act 115/1990) and the International Air Services Act of 1993 (Act 60/1993) as applicable		
Date of Issue: 2019 -06- 06	FOR DIRECTOR CIVIL AVIATION	Captain Eric Matlaba Senior Manager: Flight Operations Civil Aviation Authority
Issued at: MIDRAND SOUTH AFRICA	SIGNATURE	NAME AND TITLE
	EXECUTIVE: AVIATION SAFETY OPERATIONS	
This certificate and its annex was issued without any alteration or erasure CAA/FOD/ROC0000000082		

CAA/FOD/ROC 0000000082
FO NO:14232

AIR SERVICES LICENSING COUNCIL
Private Bag x193, Pretoria, 0001
Forum Building, cor Struben and Bosman Streets, Pretoria

TV2/279

REPUBLIC OF SOUTH AFRICA

AIR SERVICE LICENSING COUNCIL

AIR SERVICES LICENSING ACT, 1990 (ACT No. 115 OF 1990)

CLASS III AIR SERVICE LICENCE

Issued in terms of section 17(1) of Act No. 115 of 1990

Licence Number: G1271D

DARKWING AERIALS (PTY) LTD (2014/083598/07)
trading as
(Name of licensee)

has been authorized by the Air Service Licensing Council to operate the type(s) of air service(s) with the category(ies) of aircraft as specified hereunder:

G3, G4, and G16 (RPAS)

Category(ies) of aircraft:
A4, H1 and H2

Issued subject to the following conditions (section 16(5) and (6)):
This licence is valid subject to the following conditions: - (section 19 (b) and (c)):
On condition that the licensee commence with its operation within a period of 12 months from the day of issuance of a licence; and that the air service shall not be interrupted for a period exceeding 12 months; and on condition that the licensee is in possession of a valid Operating Certificate which is renewable annually.

Issued at PRETORIA on the **07 September 2016**

DEPARTMENT OF TRANSPORT
CIVIL AVIATION REGULATION
2016 -09- 07
PRETORIA

for AIR SERVICE LICENSING COUNCIL

This licence was issued without any alteration or erasure